LWG
LOWER WILLAMETTE GROUP

PORTLAND HARBOR RI/FS

INTERIM DELIVERABLE FOR HUMAN HEALTH RISK ASSESSMENT:

ROUND 1 DATA GAPS ANALYSIS

DRAFT
October 12, 2004

DO NOT QUOTE OR CITE:
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Prepared for:
The Lower Willamette Group

Prepared by:
Kennedy/Jenks Consultants

1.0 Introduction

The Baseline Human Health Risk Assessment (BHHRA) will be completed as part of the remedial investigation/feasibility study (RI/FS) for the Portland Harbor Superfund Site (Site). The overall objective of the BHHRA will be to determine whether exposure to chemicals in sediment, water, or biota within the Site results in unacceptable risks to human health. The BHHRA will be based on data collected during the RI/FS, as well as historical data of confirmed quality.

The RI/FS is being conducted in an iterative process that addresses the relationships among the factors that may affect chemical distribution, risk estimates, and remedy selection. Currently, four rounds of field investigations are planned as part of the overall RI/FS. Consistent with EPA's data quality objectives (DQO) planning process (EPA 2000), data collected during one round of field investigation will be evaluated and used in identifying data needs for subsequent rounds of investigation.

The DQO process is a systematic planning process for the collection of environmental data and is designed to ensure that any data gaps, when filled, will meet the needs of the project. The seven-step DQO process documents the following:

1. Problems or issues that led to the investigation.
2. Decisions to be made or questions to be answered.
3. Inputs (i.e., types and source of data or information) to that decision.
4. Spatial and temporal boundaries of the project.
5. Decision rules or performance criteria used to evaluate the quality of the data and determine the outcome of the decision.
6. Tolerable error relative to the decision rule.
7. A sampling design and analysis plan that will collect the appropriate type and quality of data to meet the project objectives.

The overall RI/FS sampling design presented in the *Portland Harbor RI/FS Programmatic Work Plan* (Integral Consulting, Inc. et al. 2004) (Work Plan), which was approved by EPA on June 29, 2004, was developed using the DQO process. A summary of the DQO process and the data needs identified for the BHHRA are shown in Table 1. These DQOs were used in designing the Round 1 investigation for support of the BHHRA.

This interim deliverable reviews the Round 1 data collected to support the BHHRA and identifies additional data needs for the BHHRA following the

Round 1 investigation. This interim deliverable only assesses data needs specifically for the BHHRA and does not address other elements of the RI/FS.

2.0 Summary of Round 1 Data

Round 1 was conducted in 2002 and focused primarily on chemical concentrations in fish and shellfish tissue and beach sediments. Black crappie, carp, smallmouth bass, brown bullhead, and crayfish were the fish and shellfish species collected during Round 1 to support the BHHRA. Beach sediment samples were also collected during Round 1 to support the BHHRA.

The fish and shellfish samples collected during Round 1 are discussed in Section 2.2 of the *Portland Harbor RI/FS Round 1 Site Characterization Summary Report* (Integral Consulting, Inc. 2004) (Round 1 SCSR). The analytical results are presented in Section 4.2 of the Round 1 SCSR.

The beach sediment samples collected during Round 1 are also discussed in Section 2.2 of the Round 1 SCSR. The analytical results are presented in Section 4.1 of the Round 1 SCSR.

3.0 Assessment of Round 1 Data

As stated in the DQOs for the BHHRA, sediment, surface water, groundwater seeps, and biota are the media that need to be considered for potential human exposures. The media sampled during Round 1 to support the BHHRA were biota and sediment.

3.1 BIOTA

The following subsections assess the adequacy of the biota data collected during Round 1 relative to the DQOs for the BHHRA.

3.1.1 Target Species and Sample Types

The biota identified in the DQOs for evaluation in the BHHRA includes resident fish and shellfish species, and salmon, sturgeon, and lamprey. In accordance with the RI/FS approach described in the Work Plan, only resident fish and shellfish species were collected during Round 1.

Black crappie, brown bullhead, carp, and smallmouth bass were the target resident fish species identified for potential human consumption in the *Programmatic Work Plan, Appendix C: Human Health Risk Assessment Approach* (Integral Consulting, Inc., et al. 2004) (Appendix C of the Work Plan). Crayfish was the target shellfish species identified for potential human consumption. All of the target resident fish and shellfish species identified for potential human consumption were collected during Round 1.

For target resident fish, both whole body and fillet tissue samples were analyzed for each of the species collected.

3.1.2 Sample Locations

The DQOs identify the Site as the spatial boundary for target resident fish and shellfish samples. The Site boundaries have not been established, so the sampling and analysis activities in Round 1 focused on the Initial Study Area (ISA; river mile 3.5 to 9.2) that was identified by EPA in the Administrative Order on Consent, which should be representative of conditions in the Site. The resident fish and shellfish were collected at locations throughout the ISA.

Individual resident fish and shellfish specimens were composited by sample location in accordance with the compositing schemes in the EPA-approved *Portland Harbor RI/FS Round 1A Fish Tissue Compositing and Shipping SOP* (Striplin et al 2002a). The compositing schemes for sample locations were developed based on potential human exposures that result from ongoing, repeated fish consumption and the home ranges of the individual species. Crayfish were composited based on individual sampling locations. Smallmouth bass were composited based on river mile locations. Black crappie, brown bullhead, and carp were composited based on fishing zones that were approximately three river miles in length.

3.1.3 Sample Numbers

The target number of composite samples for resident fish and shellfish were established in the EPA-approved *Portland Harbor RI/FS Round 1A Fish Tissue Sampling SOP* (Striplin et al 2002b) based on the data needs for both the BHHRA and the Baseline Ecological Risk Assessment. Section 2 of the Round 1 SCSR discusses the tissue samples that were collected during Round 1. A summary of the tissue samples collected to support the BHHRA is included in Table 2. The target number of composite samples were collected and analyzed during Round 1 for smallmouth bass, brown bullhead, and carp. For crayfish, six additional composite samples were collected and analyzed during Round 1. For black crappie, only four whole body and four fillet composite samples were collected and analyzed due to the inability to catch a sufficient number of individual fish within the ISA. The reduced number of samples will limit the evaluation of variability in black crappie tissue concentrations, but should not impact the overall evaluation of risks in the BHHRA.

3.1.4 Analytical Parameters

The analytical parameters for Round 1 tissue samples were listed in the EPA-approved *Portland Harbor RI/FS Round 1 Quality Assurance Project Plan* (Striplin 2002) (Round 1 QAPP) and were established based on historical data for the Site and potential chemical uses associated with past and current activities at the Site. The target resident fish and shellfish samples were analyzed for all of the parameters specified in the Round 1 QAPP. The analytical parameters included metals, semivolatile organic compounds (SVOCs), dioxins and furans, polychlorinated

biphenyl (PCB) congeners, butyltins, organochlorine pesticides, and PCB Aroclors. Complete analyte lists for the tissue samples are presented in the Round 1 SCSR.

3.1.5 Detection Limits

Analytical concentration goals (ACGs) for the Round 1 analytes were established by EPA for Round 1 tissue samples during development of the Round 1 QAPP. The ACGs were developed based on conservative assumptions and represent concentrations below which chemicals are unlikely to pose a risk to human health or the environment. Project-specific method reporting limits (MRLs) for the Round 1 analytes were established by the analytical laboratories during development of the Round 1 QAPP. The MRLs were developed based on analytical capabilities to be lower than or as close to the ACGs as technically possible.

In evaluating potential data gaps remaining after Round 1, the adequacy of detection limits was evaluated for all analytes that were not detected in the Round 1 tissue samples. This evaluation is important because risk-based conclusions can be drawn with a high degree of confidence for chemicals that were not detected, and for which detection limits were below the ACGs. If chemicals were not detected and the detection limits exceeded ACGs, further analysis of the potential risk and uncertainty associated with those chemicals is necessary.

Chemicals that were not detected in any of the target resident fish or shellfish samples collected to support the BHHRA and the range of detection limits for those chemicals are shown in Table 3. The ACGs and MRLs for these chemicals from the Round 1 QAPP are also shown in Table 3.

For many of the chemicals that were not detected, ACGs had not been established. In some cases, these chemicals will be evaluated as part of specific chemical mixtures (e.g., total PCBs) in the BHHRA. Because other chemicals in the mixtures were detected in the Round 1 tissue samples, not detecting the chemical will not impact the results of the BHHRA. The other chemicals without ACGs that were not detected will be discussed in the uncertainty assessment of the BHHRA.

For other chemicals, detection limits were less than or equal to the established ACGs. Because these chemicals were confirmed to not be present in the target fish or shellfish samples at risk-based screening concentrations established by EPA, it can be assumed with relatively high certainty that these chemicals are unlikely to pose unacceptable risks. Therefore, not detecting these chemicals will not impact the results of the BHHRA.

For a small number of chemicals, the detection limits were greater than the established ACGs. However, for these chemicals, the project-specific MRLs established in the Round 1 QAPP were also greater than the established ACGs indicating that it is not technically feasible to detect concentrations at the level of the

ACGs. The inability to detect these chemicals will be discussed as an uncertainty in the BHHRA.

3.2 SEDIMENT

The following subsections assess the adequacy of the sediment data collected during Round 1 relative to the DQOs for the BHHRA.

3.2.1 Sample Types

Beach and in-water sediment are the types of sediment samples identified in the DQOs for evaluation in the BHHRA. Both beach and in-water sediment samples were collected during Round 1.

3.2.2 Sample Locations

Beach sediment composite samples were collected during Round 1 from human use areas in the ISA that were identified through site reconnaissance and input from EPA and its partners. Beach sediment composite samples were collected from all of the human use areas the EPA identified in its letter approving the beach sediment sampling (September 20, 2002). Five additional human use areas identified by the LWG were also sampled during Round 1.

In-water sediment samples were collected at stations where crayfish, sculpin, and/or clam tissue samples were collected. The primary objective of these samples was to evaluate relationships between chemical concentrations in sediment and tissue. However, these data can also be used to evaluate risks to humans resulting from direct contact with in-water sediment.

3.2.3 Sample Numbers

Twenty beach sediment composite samples were collected and analyzed during Round 1. At least one composite sample was collected from every human use area identified in Appendix C of the Work Plan. The Round 1 SCSR discusses the beach sediment samples that were collected during Round 1 and presents the locations of those samples.

Thirty-six in-water sediment samples were collected and analyzed during Round 1 at stations throughout the ISA. Up to nine sediment stations were sampled for a given river mile. The numbers and locations of these sediment samples are described further in the Round 1 SCSR.

3.2.4 Analytical Parameters

The analytical parameters for Round 1 sediment samples were listed in the Round 1 QAPP and were established based on historical data for the Site and potential chemical uses associated with past and current activities at the Site. The beach and in-water sediment samples were analyzed for all of the parameters specified in the

Round 1 QAPP. The analytical parameters included metals, organochlorine pesticides, PCB Aroclors, chlorinated herbicides, volatile organic compounds, SVOCs, butyltins, dioxins and furans, and PCB congeners. Complete analyte lists for the sediment samples are presented in the Round 1 SCSR.

3.2.5 Detection Limits

Chemicals that were not detected in any of the beach sediment composite samples and the range of detection limits for those chemicals are shown in Table 4. ACGs and project-specific MRLs for these chemicals from the Round 1 QAPP are also shown in Table 4. The ACGs, which were established by EPA for Round 1 sediment samples, were not based on risks to human health through direct contact with sediment. Because direct contact is the only exposure to sediment that will be evaluated in the BHHRA, the ACGs are not appropriate for purposes of the BHHRA itself. EPA Region 9 preliminary remediation goals (PRGs) for residential soil (EPA 2002), which will be used in the BHHRA as risk-based screening levels for beach sediment, are based on direct contact and are also shown in Table 4.

For most of the chemicals, detection limits were less than or equal to the Region 9 PRGs. Because these chemicals were confirmed to not be present in beach sediment samples at or above risk-based screening concentrations established by EPA, it can be assumed with relatively high certainty that these chemicals are unlikely to pose unacceptable risks. Therefore, not detecting these chemicals will not impact the results of the BHHRA.

For other chemicals that were not detected, Region 9 PRGs have not been established, indicating that toxicity data are not available for that chemical. If toxicity data are not available, the chemical will not be evaluated quantitatively in the BHHRA, so not detecting the chemical will not impact the results of the BHHRA. The inability to assess the toxicity of these chemicals will be discussed as an uncertainty in the BHHRA.

Only one chemical, n-nitrosodimethylamine (NDMA), was not detected with detection limits greater than the Region 9 PRGs. In this case, the project-specific MRL established in the Round 1 QAPP is also greater than the Region 9 PRG indicating that it is not technically feasible to detect concentrations at the level of the Region 9 PRG. The inability to detect this chemical in beach sediment will be discussed as an uncertainty in the BHHRA.

Because additional in-water sediment samples are being collected during Round 2, it is premature to evaluate chemicals that were not detected for in-water sediment samples. An analysis of chemicals that were not detected and the associated detection limits for in-water sediment samples will be conducted following Round 2.

4.0 Reassessment of Data Needs

The media initially identified in the DQOs for the BHHRA were biota, sediment, surface water, and groundwater seeps. Based on the conceptual site model in Appendix C of the Work Plan and the current understanding of the Site, no additional media are needed for evaluation. The data needs for biota, sediment, surface water, and groundwater seeps for purposes of the BHHRA following the Round 1 investigation are discussed below.

4.1 BIOTA

All of the target resident fish and shellfish species identified for potential human consumption in Appendix C of the Work Plan were collected and analyzed during Round 1. The number and locations of samples collected will be sufficient to assess risks to human health through fish consumption. The samples were analyzed for an extensive list of chemicals that was developed from historical data as well as past and current activities at the Site. Most of the chemicals that were not detected had detection limits below the ACGs, resulting in a high degree of confidence that these chemicals are not present at concentrations that represent a risk to human health or the environment. For the chemicals with detection limits above the ACGs, the MRLs were also above the ACGs, so further sampling and analysis would not result in detection limits below the ACGs. Therefore, the target resident fish and shellfish data collected during Round 1 meet the DQOs for the BHHRA, and further collection of target resident fish or shellfish is not needed for purposes of the BHHRA.

Risk from consumption of salmon, sturgeon, and lamprey will also be evaluated in the BHHRA. These species were not collected during Round 1, so salmon, sturgeon, and lamprey tissue concentrations were a data gap following the Round 1 sampling event. However, sturgeon, adult spring Chinook, and adult Pacific lamprey were collected in the summer of 2003 through a cooperative effort of the Oregon Department of Human Services (ODHS), Agency for Toxic Substances and Disease Registry (ATSDR), Oregon Department of Fish and Wildlife (ODFW), the City of Portland, and EPA Region 10. The results of this sampling effort are anticipated to address the data need for salmon, sturgeon, and lamprey tissue concentrations and will be used in the BHHRA to evaluate risks from consumption of salmon, sturgeon, and lamprey.

4.2 SEDIMENT

Beach sediment composite samples were collected from every human use area identified in Appendix C of the Work Plan, which include all human use areas within the ISA. At least one composite sample was collected from each human use area. Beach sediment samples were analyzed for an extensive list of chemicals that was developed from historical data as well as past and current activities at the Site. With the exception of NDMA, all chemicals that were not detected had detection limits

below the EPA Region 9 PRGs for residential soil or did not have EPA Region 9 PRGs. The MRL for NDMA is greater than the EPA Region 9 PRG for residential soil, so further sampling and analysis still would not result in detection limits lower than the PRG. Therefore, the beach sediment data collected during Round 1 meet the DQOs for the BHHRA, and further collection of beach sediment data within the ISA is not needed for the BHHRA.

At the request of EPA, additional beach sediment samples are being collected from human use areas downstream of the ISA as part of Round 2. Data from these beach sediment samples will be evaluated following Round 2 for use in the BHHRA.

In-water sediment samples were collected during Round 1 with the primary objective of evaluating relationships between chemical concentrations in sediment and tissue. The sediment samples were collected at stations throughout the ISA and were analyzed for an extensive list of chemicals that was developed from historical data as well as past and current activities at the Site. Although these samples were not collected for the BHHRA, the in-water sediment data meet the DQOs for the BHHRA and will be included in the dataset evaluated in the BHHRA. Additional in-water sediment samples are being collected during Round 2. These sediment data will be evaluated following Round 2 for use in the BHHRA.

4.3 SURFACE WATER

Surface water samples were not collected during Round 1. Surface water samples will be collected and analyzed during Round 2. Surface water data will be evaluated following Round 2 for use in the BHHRA.

4.4 GROUNDWATER SEEPS

The approach to evaluate the groundwater exposure pathway for human health is still being developed through discussions with EPA and its partners. As a result, the data needs for groundwater for purposes of the BHHRA are not currently known. When the groundwater approach for the BHHRA is finalized, the data needs for the groundwater exposure pathway will be assessed.

5.0 Summary and Conclusions

Biota and sediment samples were collected during Round 1 to support the BHHRA. The resulting biota and sediment data meet the DQOs for the BHHRA. As a result, no additional resident fish or shellfish tissue samples and no additional beach sediment samples within the ISA are needed for purposes of the BHHRA. Beach sediment samples downstream of the ISA, additional in-water sediment samples, and surface water samples are currently being collected and analyzed as part of the Round 2 investigation. These data will be evaluated for use in the BHHRA following Round 2.

6.0 References

EPA. 2000. Guidance for the Data Quality Objectives Process, EPA QA/G-4. EPA/600/R-96/055. U.S. Environmental Protection Agency, Office of Environmental Information, Washington DC.

EPA. 2002. Region 9 Preliminary Remediation Goals (PRGs). 1 October 2002.

Integral Consulting, Inc. 2004. Portland Harbor RI/FS Round 1 Site Characterization Summary Report. Prepared for The Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA.

Integral Consulting, Inc., Windward Environmental, LLC, Kennedy/Jenks Consultants, Anchor Environmental, LLC, Groundwater Solutions, Inc. 2004. Portland Harbor RI/FS Programmatic Work Plan. Prepared for The Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA; Windward Environmental, LLC, Seattle, WA; Kennedy/Jenks Consultants, Portland, OR; Anchor Environmental, LLC, Seattle, WA; Groundwater Solutions, Inc., Portland, OR.

Striplin Environmental Associates, Inc. 2002. Portland Harbor RI/FS Round 1 Quality Assurance Project Plan, Final Report. Prepared for The Lower Willamette Group. Striplin Environmental Associates, Seattle, WA.

Striplin Environmental Associates, Inc., Windward Environmental, LLC, Kennedy/Jenks Consultants 2002a. Portland Harbor RI/FS Round 1A Fish Tissue Compositing and Shipping SOP. Prepared for The Lower Willamette Group. Striplin Environmental Associates, Seattle, WA; Windward Environmental, LLC, Seattle, WA; Kennedy/Jenks Consultants, Portland, OR.

Striplin Environmental Associates, Inc., Windward Environmental, LLC, Kennedy/Jenks Consultants 2002b. Portland Harbor RI/FS Round 1A Fish Tissue Sampling SOP. Prepared for The Lower Willamette Group. Striplin Environmental Associates, Seattle, WA; Windward Environmental, LLC, Seattle, WA; Kennedy/Jenks Consultants, Portland, OR.

TABLES

Table 1. The DQO Process for the Human Health Risk Assessment.

DQO Step	Output
1. State the Problem	Need to estimate potential risks to human health associated with exposure to chemicals in sediment, surface water, groundwater seeps, and/or biota that are a result of historic and ongoing activities in the ISA.
2. Identify the Decision	Determine whether exposures to chemicals in sediment, surface water, groundwater seeps, or biota that are the result of historic and ongoing activities in the Site result in unacceptable risks to human health and warrant consideration of further investigation or possible response action.
3. Identify the Inputs to the Decision	Zoning maps, city plans, discussions with EPA and its partners, and site reconnaissance surveys were used to identify potential human use areas prior to Round 1 and Round 2. Beach sediment samples collected in potential human use areas during Round 1 and in-water sediment samples collected in the Site will be used to estimate potential exposure to chemicals in sediment. Surface water data will be collected during Round 2 and will be used to estimate potential exposure to chemicals in surface water. Technically defensible studies or EPA guidance that are appropriate for Portland Harbor will be used to identify ingestion rates that can be used for biota. Resident fish and shellfish tissue samples collected during Round 1, and salmon, sturgeon, and lamprey samples collected in the summer of 2003 by ODHS, ATSDR, ODF&W, City of Portland, and EPA Region 10 along with identified appropriate ingestion rates, will be used to estimate potential exposure to chemicals in tissue. A Seep Reconnaissance Survey was conducted to identify locations of groundwater seeps where human exposure may occur. Existing groundwater data or new groundwater or seep data collected during the RI may be used to estimate potential exposures to and risks from groundwater. Toxicity information will be derived in concordance with EPA Directive OSWER Directive 9285.7-53, Human Health Toxicity Values in Superfund Risk Assessments (December 5, 2003). Analytical concentration goals were developed to be protective of human health.

Table 1. The DQO Process for the Human Health Risk Assessment.

DQO Step	Output
4. Define the Boundaries	Target media: • Sediment samples • Surface water samples • Tissue samples Spatial boundaries: • Beach sediment – Surface beach sediment within human use areas of the Site • In-water sediment – Selected in-water surface sediments collected in Round 2 in areas within the Site where fishing occurs or commercial diving has been documented. • Surface water – River water samples within areas of the Site adjacent to beaches potentially used for recreation (e.g., Swan Island Lagoon) • Tissue – Resident fish and shellfish collected within the Site • Tissue – Salmon, sturgeon, and lamprey collected by ODHS, ATSDR, ODF&W, City of Portland, and EPA Region 10 during summer 2003. Time frame: • Beach sediment – During low water when most of bank is exposed and during summer when beach use is most likely. • In-water sediment – All times • Surface water – During summer when swimming would occur • Tissue – All times with emphasis during April through October Practical constraints: • Field samples collected during times when access is adequate • Tissue – Sufficient quantity of individuals of a given species within ISA for composite samples

Table 1. The DQO Process for the Human Health Risk Assessment.

DQO Step	Output
5. Develop a Decision Rule	If the risk estimate exceeds 1 x 10^{-6} for cancer risks and/or the hazard index exceeds 1.0 for noncancer hazards, then evaluate the need for further investigations to gather additional site-specific data. The necessity for such site-specific data in making risk management decisions required for the ROD will be assessed prior to conducting further studies.
6. Specify Tolerable Limits on Decision Error	Conservative assumptions will be used and risks will be estimated using ranges of potential exposure values.
7. Optimize the Design	Collect surface sediment samples in human use areas Collect fish and shellfish tissue – whole body and fillets Collect surface water samples in human use areas

Table 2: Summary of Round 1 Tissue Samples[1]

Species	Composites Proposed	Composites Collected	Composition of each composite
Black crappie			
whole body	6	4	5 fish
fillet	6	4	5 fish
Brown bullhead			
whole body	6	6	5 fish
fillet	6	6	5 fish
Carp			
whole body	6	6	5 fish
fillet	6	6	5 fish
Smallmouth bass			
whole body	14	14	5 fish[2]
fillet	5	5	5 fish
Crayfish	21	27	> 150 grams

Notes:

[1] = only includes samples collected to support the BHHRA

[2] = some smallmouth bass composites contained less than 5 targeted fish

Table 3: Chemicals Not Detected in Round 1 Tissue Samples[1]

Analyte	Minimum Detection Limit	Maximum Detection Limit	Method Reporting Limit[2]	Analytical Concentration Goal[3]	Units
1,2,4-Trichlorobenzene	17	37	200	*	ug/kg
1,2-Dichlorobenzene	17	96	200	1620	ug/kg
1,2-Diphenylhydrazine	17	37	200	0.16	ug/kg
1,3-Dichlorobenzene	17	66	300	*	ug/kg
1,4-Dichlorobenzene	17	66	200	17	ug/kg
2,2',3,4,5,6-Hexachlorobiphenyl (PCB142)	1.34	131	NE	*	pg/g
2,3,3',4,5,5',6-Heptachlorobiphenyl (PCB192)	0.52	6.75	NE	*	pg/g
2,3,3',4,5',6-Hexachlorobiphenyl (PCB161)	0.905	132	NE	*	pg/g
2,3,4,5-Tetrachlorophenol	1300	3300	NE	540	ug/kg
2,3,5,6-Tetrachlorophenol	1300	3300	NE	540	ug/kg
2,4,5-Trichlorophenol	630	1600	500	1800	ug/kg
2,4,6-Trichlorophenol	17	37	500	117	ug/kg
2,4-Dichlorophenol	17	37	400	54	ug/kg
2,4-Dimethylphenol	380	990	200	*	ug/kg
2,4-Dinitrophenol	2500	6600	1000	*	ug/kg
2,4-Dinitrotoluene	25	73	500	*	ug/kg
2,6-Dinitrotoluene	17	37	500	*	ug/kg
2-Chloronaphthalene	17	66	200	*	ug/kg
2-Chlorophenol	25	67	300	90	ug/kg
2-Methylphenol	130	6600	600	*	ug/kg
2-Nitroaniline	630	1600	500	*	ug/kg
2-Nitrophenol	1500	1900	500	*	ug/kg
3,3',5,5'-Tetrachlorobiphenyl (PCB80)	1.83	11.2	NE	*	pg/g
3,3'-Dichlorobenzidine	1300	3300	500	*	ug/kg
3,5-Dichlorobiphenyl (PCB14)	0.375	5.81	NE	*	pg/g
3-Nitroaniline	630	1600	500	*	ug/kg
4,6-Dinitro-2-methylphenol	2500	6600	1000	*	ug/kg
4-Bromophenyl phenyl ether	17	37	100	*	ug/kg
4-Chloro-3-methylphenol	250	660	200	*	ug/kg
4-Chloroaniline	83	190	300	*	ug/kg
4-Chlorophenyl phenyl ether	42	93	100	*	ug/kg
4-Nitroaniline	630	1600	500	*	ug/kg
4-Nitrophenol	1300	3300	600	*	ug/kg
Acenaphthylene	17	90	100	*	ug/kg
Aldrin	1	13	1	0.025	ug/kg
Aniline	1500	1900	200	*	ug/kg
Anthracene	17	93	200	5400	ug/kg
Aroclor 1016	0.95	470	2	0.21	ug/kg
Aroclor 1221	0.95	390	4	0.21	ug/kg
Aroclor 1242	0.95	630	2	0.21	ug/kg
Aroclor 1254	1	5200	2	0.21	ug/kg
Aroclor 1262	0.95	190	2	0.21	ug/kg
Aroclor 1268	0.95	190	2	0.21	ug/kg
Azobenzene	130	330	NE	*	ug/kg
Benzo(a)pyrene	17	80	5	0.0575	ug/kg
Benzo(b)fluoranthene	17	63	5	0.575	ug/kg
Benzo(g,h,i)perylene	17	70	200	*	ug/kg
Benzo(k)fluoranthene	17	77	5	5.75	ug/kg
Benzoic acid	7600	9400	1000	72000	ug/kg
Benzyl alcohol	250	660	600	5400	ug/kg
Bis(2-chloro-1-methylethyl) ether	130	330	300	*	ug/kg
Bis(2-chloroethoxy) methane	130	330	100	*	ug/kg
Bis(2-chloroethyl) ether	17	37	200	*	ug/kg
Butylbenzyl phthalate	250	660	800	3600	ug/kg
Carbazole	17	37	5	21	ug/kg
cis-Nonachlor	1	17	1	*	ug/kg
Dibenz(a,h)anthracene	17	37	5	0.0575	ug/kg
Dibutyl phthalate	250	660	200	1800	ug/kg
Diethyl phthalate	130	950	100	*	ug/kg
Dimethyl phthalate	130	330	100	180000	ug/kg
Endrin ketone	1	20	1	*	ug/kg
Heptachlor epoxide	1	8	1	0.046	ug/kg
Hexachlorocyclopentadiene	630	1600	500	*	ug/kg
Hexachloroethane	1	37	NE	18	ug/kg
Indeno(1,2,3-cd)pyrene	17	37	5	0.575	ug/kg
Isophorone	1500	1900	200	*	ug/kg
Mirex	1	6.2	1	3.6	ug/kg
Nitrobenzene	17	37	400	*	ug/kg
N-Nitrosodimethylamine	130	190	200	0.025	ug/kg
N-Nitrosodiphenylamine	130	330	200	*	ug/kg
N-Nitrosodipropylamine	17	37	300	0.18	ug/kg
Toxaphene	50	6900	50	0.38	ug/kg

Notes:

[1] = only includes samples collected to support the BHHRA

Table 3: Chemicals Not Detected in Round 1 Tissue Samples[1]

Analyte	Minimum Detection Limit	Maximum Detection Limit	Method Reporting Limit[2]	Analytical Concentration Goal[3]	Units

[2] = Project-specific method reporting limits (MRLs) were established in the Round 1 QAPP

[3] = Analytical concentration goals (ACGs) were established by EPA and were presented in the Round 1 QAPP

NE = A project-specific MRL was not established in the Round 1 QAPP
* = A risk-based ACG was not established by EPA

Table 4: Chemicals Not Detected in Round 1 Beach Sediment Samples

Analyte	Minimum Detection Limit	Maximum Detection Limit	Method Reporting Limit[1]	Analytical Concentration Goal[2]	EPA Region 9 Residential Soil PRG[3]	Units
1,2,4-Trichlorobenzene	19	98	20	*	650000	ug/kg
1,2-Dichlorobenzene	19	98	20	184	370000	ug/kg
1,3-Dichlorobenzene	19	98	20	*	16000	ug/kg
1,4-Dichlorobenzene	19	98	20	2	3400	ug/kg
2,3,4,5-Tetrachlorophenol	94	490	NE	157	**	ug/kg
2,3,4,6-Tetrachlorophenol	94	490	NE	157	1800000	ug/kg
2,3,5,6-Tetrachlorophenol	94	490	NE	157	**	ug/kg
2,4,5-T	1.5	9.3	1.7	2.8	490000	ug/kg
2,4,5-Trichlorophenol	94	490	100	524	6100000	ug/kg
2,4,6-Trichlorophenol	94	490	100	1.8	6100	ug/kg
2,4-D	6.1	7.4	6.6	2.8	690000	ug/kg
2,4-DB	31	220	45	2.2	490000	ug/kg
2,4-Dichlorophenol	56	290	60	16	180000	ug/kg
2,4-Dimethylphenol	56	290	20	*	1200000	ug/kg
2,4-Dinitrophenol	190	980	200	*	120000	ug/kg
2,4-Dinitrotoluene	94	490	100	*	720	ug/kg
2,6-Dinitrotoluene	94	490	100	*	720	ug/kg
2-Chloronaphthalene	19	98	20	*	4900000	ug/kg
2-Chlorophenol	19	98	20	26	63000	ug/kg
2-Methylphenol	19	98	20	*	3100000	ug/kg
2-Nitroaniline	94	490	100	*	1700	ug/kg
2-Nitrophenol	94	490	100	*	**	ug/kg
3,3'-Dichlorobenzidine	94	490	100	*	1100	ug/kg
3-Nitroaniline	110	590	120	*	**	ug/kg
4,6-Dinitro-2-methylphenol	190	980	200	*	**	ug/kg
4-Bromophenyl phenyl ether	19	98	20	*	**	ug/kg
4-Chloro-3-methylphenol	38	200	40	*	**	ug/kg
4-Chloroaniline	56	290	60	*	240000	ug/kg
4-Chlorophenyl phenyl ether	19	98	20	*	**	ug/kg
4-Methylphenol	19	98	20	26	310000	ug/kg
4-Nitroaniline	94	490	100	*	**	ug/kg
4-Nitrophenol	94	490	100	*	**	ug/kg
Aldrin	0.19	3.9	0.2	0.00038	29	ug/kg
alpha-Endosulfan	0.19	3.9	0.2	1.7	370000	ug/kg
alpha-Hexachlorocyclohexane	0.19	3.9	0.2	0.001	90	ug/kg
Aniline	19	98	20	*	85000	ug/kg
Aroclor 1016	3.8	4	5	*	3900	ug/kg
Aroclor 1221	7.5	7.9	10	*	220	ug/kg
Aroclor 1232	3.8	4	5	*	220	ug/kg
Aroclor 1242	3.8	4	5	0.004	220	ug/kg
Azobenzene	19	98			4400	ug/kg
Benzoic acid	190	980	200	*	100000000	ug/kg
Benzyl alcohol	94	490	20	*	18000000	ug/kg
beta-Endosulfan	0.38	7.7	0.4	*	370000	ug/kg
beta-Hexachlorocyclohexane	0.19	42	0.2	0.0036	320	ug/kg
Bis(2-chloro-1-methylethyl) ether	19	98	20	*	2900	ug/kg
Bis(2-chloroethoxy) methane	19	98	20	*	**	ug/kg
Bis(2-chloroethyl) ether	38	200	40	*	210	ug/kg
Butylbenzyl phthalate	19	98	20	400	12000000	ug/kg
cis-Nonachlor	0.38	7.7	0.4	*	1600	ug/kg
Dalapon	15	36	45	*	1800000	ug/kg
delta-Hexachlorocyclohexane	0.19	3.9	0.2	*	**	ug/kg
Dicamba	3	3.3	20	*	1800000	ug/kg
Dichloroprop	6.2	29	10	*	**	ug/kg
Dieldrin	0.38	7.7	0.4	0.0004	30	ug/kg
Dimethyl phthalate	19	98	20	20000	100000000	ug/kg
Di-n-octyl phthalate	19	98	20	40.9	2400000	ug/kg

Table 4: Chemicals Not Detected in Round 1 Beach Sediment Samples

Analyte	Minimum Detection Limit	Maximum Detection Limit	Method Reporting Limit[1]	Analytical Concentration Goal[2]	EPA Region 9 Residential Soil PRG[3]	Units
Dinoseb	3	3.3	20	*	61000	ug/kg
Endosulfan sulfate	0.38	7.7	0.4	*	370000	ug/kg
Endrin	0.38	13	0.4	0.084	18000	ug/kg
Endrin aldehyde	0.38	11	0.4	*	**	ug/kg
Endrin ketone	0.38	20	0.4	*	**	ug/kg
gamma-Hexachlorocyclohexane	0.19	3.9	0.2	0.005	440	ug/kg
Heptachlor	0.19	3.9	0.2	0.0014	110	ug/kg
Heptachlor epoxide	0.19	3.9	0.2	0.0007	53	ug/kg
Hexachlorobutadiene	0.2	3.9	0.2	0.6	6200	ug/kg
Hexachlorocyclopentadiene	94	490	100	*	370000	ug/kg
Hexachloroethane	1.9	98	1	2	35000	ug/kg
Isophorone	19	98	20	*	510000	ug/kg
MCPA	3100	14000	10000	*	31000	ug/kg
MCPP	3100	3300	10000	*	61000	ug/kg
Methoxychlor	1.9	39	2	1.4	310000	ug/kg
Mirex	0.38	55	0.4	0.056	270	ug/kg
Nitrobenzene	19	98	20	*	20000	ug/kg
N-Nitrosodimethylamine	94	490	100	0.0073	9.5	ug/kg
N-Nitrosodiphenylamine	19	98	20	*	99000	ug/kg
N-Nitrosodipropylamine	38	200	20	0.053	69	ug/kg
Oxychlordane	0.38	7.7	0.4	*	1600	ug/kg
Phenol	38	200	20	3146	37000000	ug/kg
Selenium	0.2	0.3	0.2	*	390000	ug/kg
Silvex	1.5	4	1.7	2.2	490000	ug/kg
Toxaphene	19	680	100	0.0059	440	ug/kg
trans-Nonachlor	0.38	7.7	0.4	*	1600	ug/kg

Notes:

[1] = Project-specific method reporting limits (MRLs) were established in the Round 1 QAPP

[2] = Analytical concentration goals (ACGs) were established by EPA and were presented in the Round 1 QAPP

[3] = EPA Region 9 Preliminary Remediation Goals (PRGs) for residential soil (EPA 2002)

NE = A project-specific MRL was not established in the Round 1 QAPP
* = A risk-based ACG was not established by EPA
** = A Region 9 PRG is not available

LWG LOWER WILLAMETTE GROUP

Transmittal

To:	Chip Humphrey (4 copies) Eric Blischke (1 copy) US Environmental Protection Agency Region 10 811 SW 6th Avenue, 3rd Floor Portland, OR 97204 Dana Davoli (2 copies) US Environmental Protection Agency Region 10 1200 Sixth Avenue, M/S ECL-115 Seattle, WA 98104	**From:**	Bill Williams Kennedy/Jenks Consultants 2828 SW Naito Parkway, Suite 250 Portland, OR 97201
		Date:	October 12th, 2004
Re:	Portland Harbor RI/FS	**Copies to:**	Distribution List

We are sending the following items:

Number of Copies	Description
Varies	Interim Deliverable for Human Health Risk Assessment: Round 1 Data Gaps Analysis

These are transmitted:

☐ For your information ☐ For action specified below ☐ For review and comment ☐ For your use ☒ As requested

Comments:

Distribution List:

Jim Anderson
David Ashton
Eric Blischke
Ted Buerger
Brian Cunningham
Tom Downey
Rick Eichstaedt
Helen Hillman, NOAA
Audie Huber, AOC Project Coordinator
Chip Humphrey(4 copies)
Valerie Lee
Jim McKenna
Dana Davoli **(2 copies)**
Susan Thompson
Preston Sleeger (Transmittal only)
Dave Stone
Rod Thompson, AOC Project Coordinator
Paul Ward
Robert Wyatt
Patti Howard